REMARKS

The Office Action mailed April 25, 2007 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1-25 are now pending in this application. Claims 1-3, 15-17, and 19-25 stand rejected. Claims 4-14 and 18 stand objected to. Claims 1, 19, and 22-25 have been amended. No new matter has been added.

Applicants acknowledge the Examiner's indication that Claims 4-14 and 18 contain allowable subject matter.

The rejection of Claims 1-3, 15-17, and 19-25 under 35 U.S.C. § 103(a) as being unpatentable over Yavuz et al. (U.S. Pat. No. 6,539,074) ("the '074 Patent") in view of Yavuz et al. (U.S. Pat. No. 6,522,712) ("the '712 Patent") is respectfully traversed.

The '074 Patent describes methods and systems for reconstructing multiple slice images. A projection data set includes a plurality of projection views collected at different times and/or view angles, but at a single axial position (z_o) (column 9, lines 7-17 and column 10, lines 18-31). The plurality of projection views may also be acquired using a helical scan such that volumetric data representing the imaged object over a plurality of data acquisition cycles is obtained (column 14, lines 21-30). The plurality of projections views are sets of raw projection data, rather than sets of reconstructed images (*see* column 3, lines 47-62).

When a helical scan is used to acquire raw volumetric data, projection sets are selected based on a time delay after an R-wave of an electrocardiogram (EKG) signal (column 15, lines 24-32 and lines 50-63, column 16, lines 34-41, and Figures 11A-11C and 13). An operation (1240) specifies the axial positions (z_i) at which one or more slice images are to be reconstructed (column 16, lines 22-24). An operation (1250) then reconciles axial positions of selected projection data sets with the specified axial positions (z_i) for the slice images (column 16, lines 28-31). Reconstruction of a slice image at a specified axial position entails reconciliation of selected projection view sets at a single specified axial position z (Figure 15). Reconciliation is between the axial positions at which the projection view of a given set represents an object and the axial positions at which the stacked slice images are to represent the object (column 14, lines 42-45). As such, the data sets are reconciled before an image is reconstructed.

Further, the '074 Patent describes that retroactive gating may be used in magnetic resonance (MR) systems (column 8, lines 31-45). More specifically, the retroactive gating method includes stepping the phase encoding value to a next value at each successive R-wave trigger (column 8, lines 33-37). Excitation pulses run asynchronously with the cardiac cycle such that echo pulse data is acquired in each sampling cycle (column 8, lines 38-39). The pulse echo data is resorted and interpolated into evenly distributed time frames within the cardiac cycle (column 8, lines 39-41). Notably, the '074 Patent does not describe or suggest a plurality of acquired image sets that are used with the retrospective gating method. Further, the '074 Patent does not describe or suggest acquiring images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, each acquired image comprising a reconstructed image based on acquired data.

The '712 Patent describes a tomographic image generation method that includes determining a plurality of working projection views of an object at a selected view angle based on initial projection data ([θ(n), Z(m)]) collected in respective different data acquisition cycles, and interpolating between the working projection views to generate an interpolated projection view of the object at the selected view angle (column 36, lines 55-62). The initial projection data ([θ(n), Z(m)]) is raw data ([θ(n), Z(m)]) acquired during helical/cone beam scanning (column 33, lines 8-12 and lines 20-24). An additional technique for preprocessing the raw data ([θ(n), Z(m)]) is re-ordering the data in the phase domain (column 33, line 5 and lines 28-29). The three-dimensional projection data are analyzed (3702) to determine a particular set of projection views at a selected view angle for each data acquisition cycle (column 33, line 63- column 34, line 6). An operation (3730) provides a reconciliation, such as z-interpolation, between axial positions at which the projection views of the particular set represent the object and the axial positions at which stacked slice images are to represent the object (column 34, lines 7-19). After reconciliation (3730), an operation (3740) reconstructs slice images at the respective specified axial positions (column 34, lines 20-29). Notably, the '712 Patent does not describe or suggest acquiring images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, each acquired image comprising a reconstructed image based on acquired data.

Claim 1 recites a method for retrospective internal gating comprising "acquiring images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, each acquired image comprising a reconstructed image based on acquired data; and reordering the images within at least one of the acquired image sets to obtain at least one synchronized image set, each synchronized image set including only the images acquired at a single one of the z-locations."

Neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a method for retrospective internal gating as recited in Claim 1. More specifically, neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a method that includes acquiring images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, *each acquired image comprising a reconstructed image* based on acquired data (emphasis added). Rather, in contrast to the present invention, the '074 Patent describes acquiring a plurality of projection views that are at a single, axial position but at different times and/or view angles, wherein the projection views each include a *set of raw projection data*, and the '712 Patent describes reconciling an axial position at which projection views of *a particular raw data set* represent an object and an axial position at which stacked slice images are to represent the object.

Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over the '074 Patent in view of the '712 Patent.

Claims 2, 3, 15-17, and 19-21 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 2, 3, 15-17, and 19-21 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 2, 3, 15-17, and 19-21 likewise are patentable over the '074 Patent in view of the '712 Patent.

Claim 22 recites a computer-readable medium encoded with a program configured to "acquire images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, each acquired image *comprising* a reconstructed image based on acquired data; and reorder the images within at least one of the

acquired image sets to obtain at least one synchronized image set, each synchronized image set including only the images acquired at a single one of the z-locations."

Neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a computer-readable medium as recited in Claim 22. More specifically, neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a computer-readable medium encoded with a program configured to acquire images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, *each acquired image comprising a reconstructed image* based on acquired data (emphasis added). Rather, in contrast to the present invention, the '074 Patent describes acquiring a plurality of projection views that are at a single, axial position but at different times and/or view angles, wherein the projection views each include a *set of raw projection data*, and the '712 Patent describes reconciling an axial position at which projection views of *a particular raw data set* represent an object and an axial position at which stacked slice images are to represent the object.

Accordingly, for at least the reasons set forth above, Claim 22 is submitted to be patentable over the '074 Patent in view of the '712 Patent.

Claim 23 recites a computer configured to "acquire images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, each acquired image *comprising* a reconstructed image based on acquired data; and reorder the images within at least one of the acquired image sets to obtain at least one synchronized image set, each synchronized image set including only the images acquired at a single one of the z-locations."

Neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a computer as recited in Claim 23. More specifically, neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a computer configured to acquire images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, e*ach acquired image comprising a reconstructed image* based on acquired data (emphasis added). Rather,

in contrast to the present invention, the '074 Patent describes acquiring a plurality of projection views that are at a single, axial position but at different times and/or view angles, wherein the projection views each include a *set of raw projection data*, and the '712 Patent describes reconciling an axial position at which projection views of *a particular raw data set* represent an object and an axial position at which stacked slice images are to represent the object.

Accordingly, for at least the reasons set forth above, Claim 23 is submitted to be patentable over the '074 Patent in view of the '712 Patent.

Claim 24 recites an imaging system comprising "a scanner configured to generate attenuation data by scanning an object; and a controller electrically coupled to the scanner, the controller configured to: acquire images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, each acquired image *comprising* a reconstructed image based on acquired data; and reorder the images within at least one of the acquired image sets to obtain at least one synchronized image set, each synchronized image set including only the images acquired at a single one of the z-locations."

Neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests an imaging system as recited in Claim 24. More specifically, neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests an imaging system that includes a controller configured to acquire images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, *each acquired image comprising a reconstructed image* based on acquired data (emphasis added). Rather, in contrast to the present invention, the '074 Patent describes acquiring a plurality of projection views that are at a single, axial position but at different times and/or view angles, wherein the projection views each include a *set of raw projection data*, and the '712 Patent describes reconciling an axial position at which projection views of *a particular raw data set* represent an object and an axial position at which stacked slice images are to represent the object.

Accordingly, for at least the reasons set forth above, Claim 24 is submitted to be patentable over the '074 Patent in view of the '712 Patent.

Claim 25 recites a computed tomography (CT) imaging system comprising "a radiation source; a radiation detector; and a computer electrically coupled to the source and the detector, the computer configured to: acquire CT images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the CT images acquired at a single one of the z-locations, each acquired CT image *comprising* a reconstructed CT image based on acquired CT data; and reorder the CT images within at least one of the acquired image sets to obtain at least one synchronized image set, each synchronized image set including only the CT images acquired at a single one of the z-locations."

Neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a computed tomography imaging system as recited in Claim 25. More specifically, neither the '074 Patent nor the '712 Patent, considered alone or in combination, describes or suggests a computed tomography imaging system that includes a computer configured to acquire CT images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the CT images acquired at a single one of the z-locations, *each acquired CT image comprising a reconstructed CT image* based on acquired CT data (emphasis added). Rather, in contrast to the present invention, the '074 Patent describes acquiring a plurality of projection views that are at a single, axial position but at different times and/or view angles, wherein the projection views each include a *set of raw projection data*, and the '712 Patent describes reconciling an axial position at which projection views of *a particular raw data set* represent an object and an axial position at which stacked slice images are to represent the object.

Accordingly, for at least the reasons set forth above, Claim 25 is submitted to be patentable over the '074 Patent in view of the '712 Patent.

Moreover, in contrast to the assertions in the Office Action, Applicants respectfully submit that it would not have been obvious to one skilled in the art to combine the teachings of the '712 Patent with the teachings of the '074 Patent to arrive at the present invention. More specifically, Applicants submit that the '074 Patent and the '712 Patent each teach

away from the present invention. If art "teaches away" from a claimed invention, such a teaching supports the nonobviousness of the invention. U.S. v. Adams, 148 USPQ 479 (1966); Gillette Co. v. S.C. Johnson & Son, Inc., 16 USPQ2d 1923, 1927 (Fed. Cir. 1990). In light of this standard, it is respectfully submitted that the cited art, as a whole, is not suggestive of the presently claimed invention.

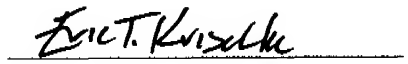
More specifically, the '074 Patent is directed to processing raw volumetric data because raw volumetric data may include additional information about the imaged object with respect to relationships between three-dimensional projection data representing the object at different slice locations (column 3, lines 47-57). Such additional information arises when the three-dimensional data are obtained over multiple data acquisition cycles (column 3, lines 57-59). An aspect of the invention described in the '074 Patent includes recognizing such additional information and using the information to enhance the image quality of the resulting tomographic images (column 3, lines 59-62). As such, the '074 Patent teaches away from acquiring images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, *each acquired image comprising a reconstructed image* based on acquired data (emphasis added).

Further, the '712 Patent is directed to generating additional projection views based on existing raw projection data and indirect relationships between the existing raw data, such as timing relationships between an imaged subject in a desired state and raw projection data representing the imaged subject in nearby states (column 3, lines 38-43, and column 33, lines 20-24). The raw projection data is used with the method because such data includes additional information that is extracted from relationships between the raw data and gantry location (column 33, lines 28-42). As such, the '712 Patent also teaches away from acquiring images at multiple z-locations $z_1 \ldots z_n$ and at different times $t_1 \ldots t_n$ at each of the z-locations to obtain a plurality of acquired image sets, each acquired image set including only the images acquired at a single one of the z-locations, *each acquired image comprising a reconstructed image* based on acquired data (emphasis added). Accordingly, Applicants respectfully submit that the cited art as a whole teaches away from the systems and methods for internal gating of the claimed invention.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 1-3, 15-17, and 19-25 be withdrawn.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully submitted,



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